Electrochemical Behavior of Plasma Electrolytic Oxidized Films Formed in Solution Containing Mn, Mg and Si Ions

Sang-Gyu Lim*, Han Cheol Choe
Department of Dental Materials & Research Center of Nano-Interface Activation for Biomaterials, College of Dentistry, Chosun University, Korea(E-mail: hcchoe@chosun.ac.kr)

초 록 : Titanium and its alloys that have a good biocompatibility, corrosion resistance, and mechanical properties such as hardness and wear resistance are widely used in dental and orthopedic implant applications. However, they do not form a chemical bond with bone tissue.

Plasma electrolytic oxidation (PEO) that combines the high voltage spark and electro-chemical oxidation is a novel method to form ceramic coatings on light metals such as tita-nium and its alloys. This is an excellent re-producibility and economical, because the size and shape control of the nano-structure is relatively easy.

Silicon (Si), manganese (Mn), and magne-sium (Mg) have a useful to bone. Particularly, Si has been found to be essential for normal bone, cartilage growth, and development. Mn influences regulation of bone remodeling be-cause its low content in body is connected with the rise of the concentration of calcium, phosphates and phosphatase out of cells. Pre-studies have shown that Mg plays very im-portant roles in essential for normal growth and metabolism of skeletal tissue in verte-brates and can be detected as minor constitu-ents in teeth and bone.

In this study, Electrochemical behavior of plasma electrolytic oxidized films formed in solution containing Mn, Mg and Si ions were researched using various experimental in-struments. A series of Si-Mn-Mg coatings are produced on Ti dental implant using PEO, with the substitution degree, respectively, at 5 and 10%. The potentiodynamic polarization and AC impedance tests for corrosion behav-iors were carried out in 0.9% NaCl solution at similar body temperature using a potentiostat with a scan rate of 1.67mV/s and potential range from -1500mV to + 2000mV. Also, AC impedance was performed at frequencies anging from 10MHz to 100kHz for corrosion resistance. (Supported by NRF: 2015H1C1A1035241 ; hcchoe@chosun.ac.kr).